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## FAX COVER SHEET

|                           |              |              |
|---------------------------|--------------|--------------|
| Date: April 21, 2005      | Phone Number | Fax Number   |
| To: Examiner Tianjie Chen |              | 703-872-9306 |
| From: Kevin J. Zilka      |              |              |

App. No: 10/609,062

Total Number of Pages Being Transmitted, Including Cover Sheet: 08

Message:  
Please deliver to Examiner Chen.

Examiner Chen,

The following is an Office Action that was received in our office. Please note the cover page (PTO Form PTO-90C) shows one application number (10/602,462), but the remaining pages of the action show another (10/609,062).

**Please note that 10/609,062 is not an application being handled by our office.**

Please contact me with any questions.

Thank you,

Erica Farlow

☐ Original to follow Via Regular Mail ☒ Original will Not be Sent ☐ Original will follow Via Overnight Courier

\*\*\*\*\*  
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\*\*\*\*\*

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AT (408) 971-2573 AT YOUR EARLIEST CONVENIENCE

April 21, 2005



## UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.       | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------------|------------------|
| 10/602,462  | 06/23/2003  | Daniel Wayne Bedell  | HIT1P006/HSJ9-2003-0045US | 2629             |
| 50533   | 7590        | 03/30/2005           | EXAMINER                  |                  |
| ZILKA-KOTAB, PC<br>P.O. BOX 721120<br>SAN JOSE, CA 95172-1120 |             |                      | CHEN, TIANJIE             |                  |
|   |             |                      | ART UNIT                  | PAPER NUMBER     |
|   |             |                      | 2652                      |                  |

DATE MAILED: 03/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                               |  |                                 |  |
|------------------------------|-------------------------------|--|---------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/609,062 |  | Applicant(s)<br>VENK, SRIDHARAN |  |
|                              | Examiner<br>Tianjie Chen      |  | Art Unit<br>2652                |  |
|                              |                               |  |                                 |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☐ Responsive to communication(s) filed on \_\_\_\_.

2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) 1-21 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-21 is/are rejected.

7) ☐ Claim(s) \_\_\_\_ is/are objected to.

8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

|  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)<br>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)<br>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____ | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date ____<br>5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)<br>6) <input type="checkbox"/> Other: ____ |
|--|---|

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## ***Non-Final Rejection***

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted prior Art (AAPA) in view of Jiang (US 6,455,354) and Moden (US 5,733,800).

Claims 1, 8, and 15; AAPA shows a flex circuit assembly, in [002] to [007] in Specification, for use in a head stack assembly for used in a disk drive including: a disk drive base; and a head stack assembly rotatably coupled to the disk drive base, the head stack assembly including: a rotary actuator; and a flex circuit assembly attached to the rotary actuator; the flex circuit assembly including: a flex circuit base film; an integrated circuit device disposed adjacent the flex circuit base film and including a solder bump connection; an electrically conductive trace disposed upon the flex circuit base film, the trace including a contact pad, the contact pad electrically connected to the solder bump connection; an underfill portion disposed between the flex circuit base film and the integrated circuit device for attaching the integrated circuit device to the flex circuit base film, the underfill portion being formed of an underfill material; and a glob top portion (cover portion) disposed upon the underfill portion and the flex circuit base film for sealing the electrically conductive trace.

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AAPA does not specify the material for the glob top portion and the underfill portion.

Jiang teaches that the glob top is usually made of a material of epoxy or silicone (Column 1, lines 24-24). Moden teaches an underfill made of a material of acrylic resin (Column 9, lines 12-13).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use epoxy as the glob top and acrylic resin as the underfill. The rationale is as follows: Jiang teaches that epoxy is usually used for the glob top, and Moden teaches that such chosen underfill has better thermal, mechanical and viscous properties (Column 9, lines 12-28). One of ordinary skill would have been motivated to use these materials thus make up the device and obtaining better thermal, mechanical and viscous properties. In thus constructed device the glob top material being different than the underfill material.

Claims 2, 9, and 16; in the above constructed device, the underfill material is a no-flow encapsulant after cured.

Claims 3, 10, and 17; in the above constructed device, the underfill material is a capillary flow encapsulant (Column 9, lines 5-11).

Claims 4, 11, and 18; AAPA shows a flex circuit cover film disposed upon the flex circuit base film, the flex circuit cover film includes an opening, the integrated circuit device and the electrically conductive trace are disposed within the opening.

Claims 5, 12, and 19; AAPA shows that the underfill portion and next applied material for covering are both disposed in the opening ([007]). In the above, constructed device, the next applied material is the glob top material.

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Claims 6, 13, and 20; it is well known in the art that a wide range of materials have been used for the integrated circuit, the flex circuit base and underfill. No unexpected result has been disclosed in this application for set the relationship of coefficients of thermal expansion in such a way. One of ordinary skill in the art would have been choosing the materials through experimentation and optimization, which may include a set: underfill portion use acrylic having has a coefficient of thermal expansion of  $3.8 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , which is between the thermal expansion between coefficients of thermal expansion of the integrated circuit device, which uses a commonly used glass reinforced Nylon having a coefficient of thermal expansion of  $1.3 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , and the flex circuit base film made of Polyester having a coefficient of thermal expansion of  $6.9 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ .

Claims 7, 14, and 21; in above constructed device, underfill portion (acrylic) inherits a coefficient of thermal expansion of  $3.8 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , which is greater than inherited coefficient of thermal expansion of  $3.0 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$  of the glob top portion (epoxy).

### **Conclusion**

2. The prior art made of record in PTO-892 Form and not relied upon is considered pertinent to applicant's disclosure.

Web search report indicates: glass reinforced Nylon having a coefficient of thermal expansion of  $1.3 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , Polyester having a coefficient of thermal expansion of  $6.9 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , acrylic has a coefficient of thermal expansion of  $3.8 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ , and epoxy has a coefficient of thermal expansion of  $3.0 \text{ X in/in/}^{\circ}\text{F X } 10^{-5}$ .


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is 571-272-7570. The examiner can normally be reached on 8:00 – 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**TIANJIE CHEN**  
**PRIMARY EXAMINER**

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| Q |  |  |  |  |  |
| R |  |  |  |  |  |
| S |  |  |  |  |  |
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**NON-PATENT DOCUMENTS**

| * |                                     | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|-------------------------------------|---|
| U | <input checked="" type="checkbox"/> | Web search report, 1 page   |
| V | <input type="checkbox"/>            |   |
| W | <input type="checkbox"/>            |   |
| X | <input type="checkbox"/>            |   |

plastic coefficient of thermal expansion

Web Search Report j/10/1



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## Products



### Typical Linear coefficient of expansion for common Plastics

| Material                                 | in/in/°F x 10 <sup>-5</sup> | cm/cm/°C x 10 <sup>-5</sup> |
|--|-----------------------------|-----------------------------|
| Liquid Crystal (glass reinforced)        | 0.3                         | 0.6                         |
| Polycarbonate (glass reinforced)         | 1.2                         | 2.2                         |
| Nylon (glass reinforced)                 | 1.3                         | 2.3                         |
| TP Polyester (glass reinforced)          | 1.4                         | 2.5                         |
| ABS (glass reinforced)                   | 1.7                         | 3.1                         |
| Polypropylene (glass reinforced)         | 1.8                         | 3.2                         |
| Epoxy (glass reinforced)                 | 2.0                         | 3.6                         |
| Polyphenylene sulfide (glass reinforced) | 2.0                         | 3.6                         |
| Acetal (glass reinforced)                | 2.2                         | 4.0                         |
| Epoxy                                    | 3.0                         | 5.4                         |
| Polycarbonate                            | 3.6                         | 6.5                         |
| Acrylic                                  | 3.8                         | 6.8                         |
| ABS                                      | 4.0                         | 7.2                         |
| Nylon                                    | 4.5                         | 8.1                         |
| Acetal                                   | 4.8                         | 8.5                         |
| Polypropylene                            | 4.8                         | 8.6                         |
| TP Polyester                             | 6.9                         | 12.4                        |
| Polyethylene                             | 7.2                         | 13.0                        |

### Information Request Form

Select the items that apply, and then let us know how to contact you.

h e c c e h